PATENT CLAIMS

1. A light-emitting panel with a plurality of unhoused, light-emitting diodes which are arranged on a carrier and electrically contacted, wherein the panel is two-dimensional in sections, characterised by an optically functional, fluid-tight film (10, 100, 20) which is attached such that it covers a plurality of diodes in a manner protecting from environmental influences, and influences light emitted by these.

2. A light emitting panel according to claim 1, characterised in that the film is held at a distance to the LED-chips by spacer elements (106, 107, 108), wherein the spacer elements are distributed over the panel for example in a regular pattern or in a dispersed manner, and are of non-metallic material, or the spacer elements are attached at the edge of the panel.

3. A light-emitting panel according to claim 1 or 2, characterised in that the protective film contains dyes or phosphors for frequency conversion or filtering.

4. A light-emitting panel according to one of the preceding claims, characterised in that the protective film contains structures which act in an optically refractive or diffractive manner, for the collimation, focussing, expansion and/or deflection of light which is produced by the diodes.

5. A light-emitting panel according to one of the preceding claims, characterised in that the film contains a first and a second layer construction, which are arranged next to one another and together form a layer system which defines a plane of layering which is the x-y plane of a Cartesian coordinate system, wherein the first layer construction comprises at least one layer (12) containing fluorescent dye or diffusers, wherein the refractive index of the or each layer of the first layer construction is smaller than the optical refractive index of the or each layer of the second layer construction, wherein the second layer construction is arranged on the side facing the light-emitting diodes, and wherein the transition (13) between the first and the second layer construction contains boundary surfaces which form an angle to the plane of layering, or wherein the transition is waved.

6. A light-emitting panel according to claim 5, characterised in that an outer limitation of the film, thus a transition between the first layer construction and a surrounding medium

contains boundary surfaces which form an angle to the plane of layering, or that the outer limitation is waved.

7. A light-emitting panel according to claim 6, characterised in that the variation of the position in the z-direction of the transition between the first and the second layer construction in the Cartesian coordinate system is at least 2/3 of the thickness of the first layer construction, and the course of the transition between the first and the second layer construction correlates to the course of the transition between the first layer construction and the surrounding medium, in a manner such that the thickness of the first layer construction is at least approximately constant as a function of the x- and y-position.

8. A light-emitting panel according to one of the claims 5 to 7, characterised in that the angle between boundary surfaces between the first and the second layer construction and the x-y plane is between 12° and 45°, preferably less than 45° and for example between 15° and 35°.

9. A light-emitting panel according to one of the claims 5 to 8, characterised in that the first layer construction apart from the layer (12) containing the fluorescent dye or diffusers also comprises a first transparent protective layer (11) terminating the film to the surrounding medium, and preferably also a second transparent protective layer (13) arranged on the side of the layer (12) containing the fluorescent dye or diffusers, said side lying opposite the first protective layer.

10. A light-emitting panel according to one of the claims 5-9, characterised in that the refractive index of each layer of the first layer construction is maximally 1.5, preferably maximally 1.4 and the refractive index of each layer of the second layer construction is at least 1.6, preferably at least 1.7.

11. A light-emitting panel according to one of the preceding claims, wherein a concave-mirror-like or aperture-like optical element (24) is allocated to each LED-chip or each unit of several LED-chips arranged next to one another, by way of which the light emitted by the LED-chip or by the LED-chips may be collimated in each case in a certain spatial angle about an optical axis, wherein the concave-mirror-like or aperture-like elements of at least one sub-group with several LED-chips or units of LED-chips are aligned such that the optical axes of the sub group converge, and that the light produced by the LED-chips of the sub-group, at the location of the conversion film at least partly superimposes, and wherein at least two LED-chips of the sub-group have emission wavelengths which are different to one another.

12. A light-emitting panel according to claim 11, characterised in that the film contains a fluorescent dye and that the LED-chips of each sub-group emit blue and/or ultraviolet light at different wavelengths.

13. A light-emitting panel according to claim 11, characterised in that the film contains diffusers and that each sub-group comprises at least one LED-chip emitting blue light, one LED-chip emitting green light and one LED-chip emitting red light.

14. A light-emitting panel according to one of the claims 11 to 13, characterised in that an opaque mask layer is present on a side of the film facing the LED-chips, which comprises recesses where the spatial angles of the LED-chips of the sub-group or the sub-groups intersect.

15. A layer system for the at least partial conversion of primary light incident from a first side into secondary light radiated onto a second side, comprising a first and a second layer construction, wherein the first and the second layer construction are arranged next to one another and together form a layer system, which defines a plane of layering as the x-y plane of a Cartesian coordinate system, wherein the first layer construction comprises at least one layer containing fluorescent dye or diffusers, for the at least partial conversion of the primary light into the secondary light, wherein the refractive index of the or each layer of the first layer construction is smaller than the optical refractive index of the or each layer of the second layer construction, and wherein the transition between the first and the second layer construction contains boundary surfaces which form an angle to the plane of layering, or wherein the transition is waved.

16. A layer system according to claim 15, characterised in that an outer limitation of the layer system, thus a transition between the first layer construction and a surrounding medium, contains boundary surfaces which form an angle to the plane of layering, or that the outer limitation is waved.

17. A layer system according to claim 16, characterised in that the variation of the position in the z-direction of the transition between the first and the second layer construction in the Cartesian coordinate system is at least 2/3 of the thickness of the first layer construction, and the course of the transition between the first and the second layer construction correlates to the course of the transition between the first layer construction and the surrounding medium in a manner such that the thickness of the first layer construction is at least approximately constant as a function of the x- and y-position.

18. A layer system according to one of the claims 15 to 17, characterised in that the angle between boundary surfaces between the first and the second layer construction and the x-y plane is between 12° and 45°, preferably less than 45° and for example between 15° and 35°.

19. A organic light-emitting element with a light-emitting construction (42) which is arranged between a first, non-transparent electrode and a second, transparent electrode, and with a layer system according to one of the claims 15 to 18 arranged on the side facing the transparent electrode

20. A light-emitting panel with a carrier element (51, 61) and a multitude of unhoused LED-chips (52, 62) arranged thereon, wherein at least some of the LED-chips are provided with a covering which contains conversion dye and is deposited directly on the LED-chip, wherein the thickness of this covering is such that the covering follows the shape of the LED-chip.

21. A light-emitting panel according to claim 20, characterised in that the thickness of the covering is maximally 10 μm.

22. A light-emitting panel according to claim 20 or 21, characterised in that the covering contains an outer second protective layer (64c), a layer (64b) containing the conversion dye, as well as optionally a first protective layer (64a) bearing directly on the LED-chip.

23. A light-emitting panel according to one of the claims 20 to 22, characterised in that the covering in each case is only present locally in the vicinity of each LED-chip, and sections not provided with the covering are present between the LED-chips.

24. A light-emitting panel according to one of the claims 20-23, characterised in that a contact surface of the LED-chip is electrically connected to a contact pad via a wire bond (53), and that the first contact surface and the contact pad are coated with the covering.

25. A light-emitting panel according to one of the claims 20-23, characterised in that a contact surface (62a) of the LED-chip as well as a contact pad are free from the covering, and that the covering, the contact surface and the contact pad are coated with a transparent, electrically conductive layer (65), or that the contact surface and the contact pad are electrically connected to a strip-like, metallic layer.

26 A light-emitting panel according to one of the claims 20-23, characterised in that the covering is so thin that its volume per LED-chip and associated contact surface exceeds the volume of an LED-chip at the most by a factor of 2, and furthermore covers all open sides of the LED-chip.

27. A light-emitting panel according to one of the claims 20 to 26, characterised in that the covering contains a layer system according to one of the claims 15 to 18.

28. A method for manufacturing a light-emitting panel, in particular according to one of the claims 20-26, wherein a carrier element (61) is provided with a plurality of LED-Chips and subsequently at least in regions is coated with a covering in a batch process, said covering containing conversion dye for the at least partial conversion of the electromagnetic radiation emitted by the LED-chips, into longer-waved radiation.

29. A method according to claim 28, characterised in that the conversion dye is deposited by way of a vacuum coating method.

30. A method according to claim 29, characterised in that an optically transparent protective layer is deposited after the deposition of the dye and preferably also before the deposition of the dye, wherein the protective layer or the protective layers is/are preferably deposited by way of the vacuum coating method.

31. A method according to one of the claims 28-30, characterised in that simultaneously with the deposition of the conversion dye, transparent material is also deposited, so that it is mixed with the dye in the deposited layer.

32. A method according to one of the claims 28-31, characterised in that the layer thickness of the dye layer is 500 nm at the most.

33. A method according to one of the claims 28-32, characterised in that the contact pad and the contact surface are electrically connected to one another via the wire bond before the coating.

34. A method according to one of the claims 28-33, characterised in that the coating with the conversion dye is effected through a shadow mask, so that a structured colour conversion layer arises.

35. A method according to claim 34, characterised in that the coating with the covering is effected through a second mask (67) which covers the first contact surfaces (62a) and the

contact pad, and that the subsequent coating with the transparent, electrically conductive material is effected through a first mask (66) which covers the intermediate spaces between LED-chips such that the electrically conductive material of adjacent LEDs does not come into contact with one another.